flared notch radiating element wherein a thin gap filled by a thin layer of dielectric material is maintained between a surface of each of the radiating elements and the high impedance ground surface structure; and

a beam-forming network connected to the radiating elements wherein the beam-forming network includes a true-time-delay network, wherein time delay differences in contributions by the individual radiating elements to a composite array signal due to the separation of the elements along the axis are equalized by the true-time-delay network, wherein the true-time-delay network includes a plurality of combiner/dividers and a plurality of coaxial transmission lines and wherein the lengths of the coaxial transmission lines of the feed network provide a true-time-delay network so that the signals on receive are combined coherently and that the signals on transmit coherently form a beam in the forward direction, and wherein the radiating elements are spaced along the axis by one-quarter wavelength at a center frequency of operation for the array, and the array provides an end-fire beam in only one direction along the axis.

Please amend Claim 15 has been amended as follows:

15. (Amended) The antenna of Claim 11 wherein each flared notch radiating element includes a pair of flared dipole wings.

REMARKS

Claims 2 – 5 and 7 -- 20 are pending in the Patent Application and stand rejected. Claims 2 –5, 9, 10, and 20 are rejected under 35 U.S.C. 102(e) as being anticipated by Sievenpiper et al ('254), newly cited. Claims 7, 8, and 11 – 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sievenpiper et al ('254) in view of Hannan ('413), both newly cited.

For the following reasons, Applicants respectfully traverse Examiner's rejection of the above-referenced claims, based upon the amendments to the claims set forth in this Amendment.

Applicants have amended independent Claim 20 by incorporating the features of Claims 2, 4, and 7 herein. In addition to the features recited by independent Claim 20 and

dependent Claims 2, 4, and 7 the following additional features are now recited in Claim 20, as amended:

> a thin gap filled by a thin layer of dielectric material is maintained between an adjacent surface of the radiating element and the high impedance ground surface structure; and
> the true-time-delay corporate feed network includes a plurality of combiner/dividers and a plurality of coaxial transmission lines wherein the lengths of the coaxial transmission lines provide a true-time-delay network so that signals on receive are combined coherently and the signals on transmit coherently form a beam in the forward direction.

Examiner alleges that Claims 2-5, 9, 10, and 20 are rejected under 35 U.S.C. 102(e) as being anticipated by Sievenpiper et al ('254), newly cited, since Sievenpiper et al teaches the claimed conformal end-fire antenna including: high impedance ground surface structure and flared notch antenna. However, Sievenpiper does not teach or disclose all of the recited features of Claim 20, amended. In particular, Sievenpiper et al does not teach the above-referenced newly recited features. Nowhere do Sievenpiper et al disclose or teach a true-time-delay corporate feed, as recited in Claim 20. Nor do Sievenpiper et al disclose or teach a gap filled by a layer of dielectric material maintained between a surface of the radiating element and the high impedance ground surface structure. Consequently, Claim 20, as amended, is not anticipated by Sievenpiper.

The same argument applies for independent Claim 11, which is also not anticipated by Sievenpiper et al.

Examiner alleges that Claims 7, 8, and 11-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sivenpiper et al ('254) in view of Hannan ('413), both newly cited, since Hannan teaches the claimed conformal end-fire antenna for mounting on a nose cone of an aerial vehicle including the use of end-fire antenna and delay means. Examiner concludes that to use wide band signals, obviously the flare notch end-fire antennas of Sievenpiper et al can be used on the nose of an aircraft as taught by Hanna.

Applicants respectfully traverse the rejection of Claims 7, 8, and 11-19 under 35 U.S.C. 103(a) for the following reasons.

Although the Examiner states that to use wide band signals the flared notch end-fire antenna of Sievenpiper et al can be used on the nose of an aircraft as taught by Hannan, the references, alone or in combination, do not fairly teach or suggest the invention, as recited by the claims.

Examiner merely concludes that it would be obvious that the flared notch end-fire antenna of Sievepiper et al can be used on the nose of an aircraft as taught by Hannan to use wide band signals. However, there is simply no teaching or suggestion to modify the references as explained by Examiner, as being obvious.

Furthermore, the Lee et al ('288) referenced, previously cited and applied, although disclosing a true-time-delay corporate antenna feed, there is no motivation discussed in Lee et al or in Sievenpiper et al to combine the features of the cited references.

The Federal Circuit stated the law of obviousness in In re Kotzab, 55 USPQ 2d 1313, 1316-1317 (Fed.Cir. 2000):

> "A critical step in analyzing the patentability of claims pursuant to section 103(a) is casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the filed... Close adherence to this methodology is especially important in cases where the very ease with which the invention can be understood may prompt one 'to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher,"...[citations omitted]
>
> Most if not all inventions arise from a combination of old elements ... Thus, every element of a claimed invention may often be found in the prior art... However, identification in the prior art of each individual part claimed is insufficient to defeat patentability for the whole claimed invention... Rather, to establish obviousness based on a combination of the elements disclosed in the prior art, there must be some motivation, suggestion or teaching of the desirability of making the specific combination that was made

> by the applicant... Even when obviousness is based on a single prior art reference, there must be a showing of a suggestion or motivation to modify the teachings of that reference..." [citations omitted]

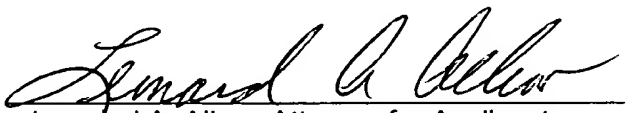
Examiner has provided no evidence of a motivation or suggestion to modify or combine the features of the Sievenpiper el al reference or the Hanna reference. The mere conclusion that "[t]o use wide band signals, obviously the flared notch end-fire antennas of Sievenpiper et al can be used on the nose of an aircraft as taught by Hannan..." does not evidence any motivation to combine the features of the references to create the present invention, as recited by the claims. Evidence of a suggestion, teaching or motivation may flow from the prior art references themselves, the knowledge of one of ordinary skill in the art, or in some cases, from the nature of the problem to be solved. The range of sources available, however, does not diminish the requirement for actual evidence. The showing of such actual evidence must be clear and particular. Broad conclusionary statements regarding the teaching of multiple references, standing alone, are not evidence. The required showing of evidence should include particular factual findings. In re Dembicazk 50 USPQ 2d 1614, 1617 (Fed.Cir. 1999)

Applicants respectfully submit that the combination of references is the product of improper hindsight reconstruction, and the rejection should be withdrawn.

Consequently, Applicants request that Claims 3, 5, 8, 9,10, 11, 15, 16, 18, and 20 be allowed and that the case pass to issue.

Respectfully submitted,

Registration No. 30,021



Leonard A. Alkov, Attorney for Applicants

Tel. No. 310.647.2577
Fax No. 310.647.2616

Raytheon Company
P.O. Box 902 (E1/E150)
El Segundo, CA 90245-0902

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS

Claims 2, 4, and 7, 12, 13, 14, 17, and 19 have been canceled.

Claim 5 has been amended as follows:

5. (Amended) The antenna of Claim [4] 20, wherein the metal plates have a hexagonal shape.

Claim 8 has been amended as follows:

8. (Amended) The array of Claim [1] 20 wherein the radiating elements are spaced along the axis by one-quarter wavelength at a center frequency of operation for the array, and the array provides an end-fire beam in only one direction along the axis.

Claim 20 has been amended as follows:

20. (Amended) A conformal end-fire antenna, comprising:

a high impedance ground surface structure, comprising an array of metal protrusions formed as metal plates connected to [on a] metal [sheet] sheets by vertical posts, the metal protrusions arranged in a two-dimensional lattice, wherein the high impedance ground surface structure is a magnetic conductor surface at an RF frequency band of interest, said ground surface structure functioning as a D.C. short and as a mirror which reflects an RF field in said frequency band with virtually no phase reversal;

an array of wide band flared notch radiating elements positioned adjacent the ground surface structure, said array of radiating elements comprising a plurality of radiating elements arranged end-to-end along a common end-fire axis and spaced apart along the axis by separation distance wherein a thin gap filled by a thin layer of dielectric material is maintained between a surface of each of the radiating elements and the high impedance ground surface structure; and

a true-time-delay corporate feed network connected to the radiating elements, wherein time delay differences in contributions by the individual radiating elements to a composite array signal due to the separation of the elements along the axis are equalized by the true-time delay corporate feed network, wherein the true-time-delay corporate feed network includes a plurality of combiner/dividers and a plurality of

coaxial transmission lines, wherein the lengths of coaxial transmission lines of the corporate feed network provide a true-time-delay network so that signals on receive are combined coherently and the signals on transmit coherently form a beam in the forward direction.

Claim 11 has been amended as follows:

11. (Amended) A conformal end-fire antenna for mounting on a nose cone of an aerial vehicle, comprising:

a high impedance ground surface structure, including an array of metal protrusions formed as metal plates connected to [on a] electrically conductive [sheet] sheets by vertical posts, the contour of the [sheets] conforming to the surface contour of the nose cone, the metal protrusions arranged in a two-dimensional lattice, wherein the high impedance ground surface structure is a magnetic conductor surface at an RF frequency band of interest, said ground surface structure functioning as a D.C. short and as a mirror which reflects an RF field in said frequency band with virtually no phase reversal;

an array of wide band flared notch radiating elements positioned adjacent the ground surface structure, said array conforming to said contour, wherein said array comprises a plurality of radiating elements arranged end-to-to end along a common end-fire axis and spaced apart along the axis by a separation distance, each element comprising a flared notch radiating element wherein thin a gap filled by a thin layer of dielectric material is maintained between a surface each of the radiating elements and the high impedance ground surface structure; and

a beam-forming network connected to the radiating elements wherein the beam-forming network includes a true-time-delay network, wherein time delay differences in contributions by the individual radiating elements to a composite array signal due to the separation of the elements along the axis are equalized by the true-time-delay network wherein the true-time-delay network includes a plurality of combiner/dividers and a plurality of coaxial transmission lines and wherein the lengths of the coaxial transmission lines of the feed network provide a true-time-delay network so that the signals on receive are combined coherently and that the signals on transmit coherently form a beam in the forward direction, and wherein the radiating elements are spaced along the axis by one-quarter wavelength at a center frequency of operation for the array, and the array provides an end-fire beam in only one direction along the axis.

Claim 15 has been amended as follows:

15. (Twice Amended) The antenna of Claim [14] 11 wherein each flared notch radiating element includes a pair of flared dipole wings.